Pemateri Utama I

PERKEMBANGAN KEILMUAN BIOLOGI DAN IMPLIKASINYA BAGI PENDIDIKAN BERKEMAJUAN

Muhammad Hazmi
Bioteknologi Pertanian dan Perkebunan

Rektor Universitas Muhammadiyah Jember

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Muhammad Hazmi
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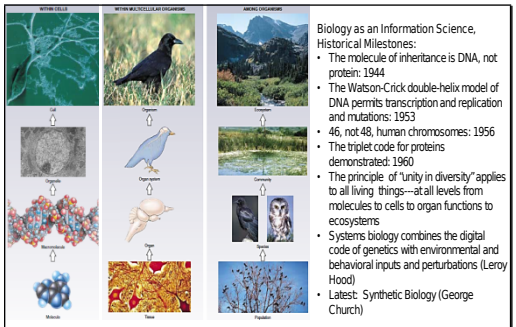
Biology is the science of life.
Biology is the science that studies living organisms and how they interact with one another and their environment.

Properties of Life. All living organisms share five basic characteristics:

1. **Order.** All organisms consist of one or more cells with highly ordered structures: atoms make up molecules, which construct cellular organelles, which are contained within cells. This hierarchical organization continues at higher levels in multicellular organisms and among organisms (figure 1).
2. **Sensitivity.** All organisms respond to stimuli. Plants grow toward a source of light, and your pupils dilate when you walk into a dark room.
3. **Growth, development, and reproduction.** All organisms are capable of growing and reproducing, and they all possess hereditary molecules that are passed to their offspring, ensuring that the offspring are of the same species. Although crystals also "grow," their growth does not involve hereditary molecules.
4. **Regulation.** All organisms have regulatory mechanisms that coordinate the organism's internal functions. These functions include supplying cells with nutrients, transporting substances through the organism, and many others.
5. **Homeostasis.** All organisms maintain relatively constant internal conditions, different from their environment, a process called homeostasis.

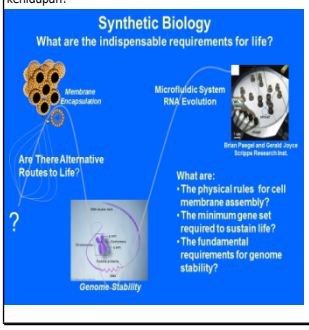


Biology as an Information Science, Historical Milestones:

- The molecule of inheritance is DNA, not protein: 1944
- The Watson-Crick double-helix model of DNA permits transcription and replication and mutations: 1953
- 46, not 48, human chromosomes: 1956
- The triplet code for proteins demonstrated: 1960
- The principle of "unity in diversity" applies to all living things—at all levels from molecules to cells to organ functions to ecosystems
- Systems biology combines the digital code of genetics with environmental and behavioral inputs and perturbations (Leroy Hood)
- Latest: Synthetic Biology (George Church)

FIGURE 1. Hierarchical organization of living things. Life is highly organized—from small and simple to large and complex, within cells, within multicellular organisms, and among organisms.(Raven and Johnson, 2011. Biology, 9th Edition 2011. McGraw-Hill.)

Biologi Sintetis?
Apa persyaratan yang sangat diperlukan untuk kehidupan?



Definition: Synthetic Biology (also known as Synbio, Synthetic Genomics, Constructive Biology or Systems Biology) – the design and construction of new biological parts, devices and systems that do not exist in the natural world and also the redesign of existing biological systems to perform specific tasks. Advances in nanoscale technologies – manipulation of matter at the level of atoms and molecules – are contributing to advances in synthetic biology.

What is synthetic biology?
Synthetic biology is the application of engineering principles to biology. This may involve redesigning a living system so that it does something – manufacture a particular substance, perhaps – that it would not naturally do. Still more ambitious are attempts not merely to re-engineer living systems, but to fashion entirely new ones: to create life itself from non-living materials.

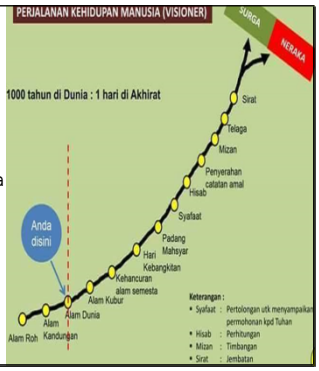
Research studies in synthetic biology are still only a decade old. The first department of synthetic biology at a major research institution – the US Lawrence Berkeley National Laboratory – was opened in 2003, and American scientists dominated much of the early research. But several European states too now have active research groups.

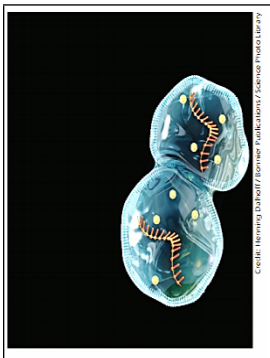
Possible uses of synthetic biology include the following:

- Energy: Custom-built microbes for generating hydrogen and other fuels, or for performing artificial photosynthesis.
- Medicine: The manufacture of drugs, vaccines and diagnostic agents, and the creation of new tissue.
- Environment: The detection of pollutants, and their breakdown or removal from the environment.
- Chemical industry: The production of fine or bulk chemicals, including proteins to provide an alternative to natural fibres or existing synthetic fibres.
- Agriculture: Novel food additives.

Konstruksi konsep kehidupan untuk pendidikan biologi berkemajuan:

1. Allah yang menghidupkan dan mematikan (2:258; 15:23; 50:43)
2. Manusia dan jin diciptakan untuk beribadah kepada Tuhan (51:56)
3. Alam diperuntukkan bagi manusia (14:32,34; 16:10,14; 45:12,13)
4. Kehidupan sebenarnya adalah di akhirat (29:64-65)
5. Akhir kehidupan adalah pertemuan dengan Allah (6:31; 10:42; 13:2; 84:6)





Artwork showing a protocell (artificial cell) dividing to produce two daughter cells.

TERIMA KASIH ATAS PERHATIANNYA